

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes</p> <p>Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven</p> <p>Date: 1996-04-17</p> <p>Location: Union Catholic</p> <p>Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman</p> <p>Verifier(s): DeLeon, Christina</p> <p>Date Transcribed: Spring 2009</p> <p>Page: 1 of 9</p>
--	---

1	R1	four things taken one at a time to four things taken two at a time.
2	Stephanie	Um hm.
3	R1	Okay.
4	R2	Okay.
5	R1	So you were going to ask another question – but you were going to do something?
6	Stephanie	No. I was just going to keep building.
7	R1	So what would you do – be building next?
8	Stephanie	Um. Towers with three reds?
9	R1	Four taken three – can you tell us what you think is going to happen and why before you do it?
10	Stephanie	Well, it would be six [<i>Stephanie points to the row of six pairs.</i>] times two. Because
11	R1	Hold on a minute.
12	Stephanie	Oh. Well, here it was
13	R1	Tell me – explain what you're doing.
14	Stephanie	'Cause here it was four times three to get the twelve, because you could <div style="text-align: center;"> $\begin{bmatrix} Y \\ Y \\ Y \\ R \end{bmatrix}$ </div> have red here [<i>She picks up</i> and <i>points to the three yellow positions on the tower one at a time as she speaks.</i>], a red here or a red here. So that's

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven Date: 1996-04-17 Location: Union Catholic Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman Verifier(s): DeLeon, Christina Date Transcribed: Spring 2009 Page: 2 of 9</p>
--	---

		<p>three – it'll produce three. And here [<i>This time she picks up</i> $\begin{matrix} Y \\ R \\ Y \\ R \end{matrix}$] you can only put a red here [<i>the top position</i>] or here [<i>the third position</i>]. So it'll produce two. And so</p>
15	R1	And so from the six you could produce
16	Stephanie	You could produce two.
17	R1	two. Any duplicates?
18	Stephanie	Yeah. There'll be duplicates. There'll be um two duplicates for each. So you divide by two – No. – Will there be two for each? I forget how many there were.
19	R1	You see. That that's the question.
20	Stephanie	I forgot how many there were. So you have to like build it.
21	R1	Okay. So could you think about it for a minute without doing it and predict?
22	Stephanie	Oh. Four.
23	R1	You predict there would be
24	Stephanie	Four. Oh. Three duplicates and then there'll be four.
25	R1	You think there would be three duplicates and then four of them.
26	Stephanie	Yeah. Because it's just the opposite of that.
27	R1	What do you mean?

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes</p> <p>Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven</p> <p>Date: 1996-04-17</p> <p>Location: Union Catholic</p> <p>Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman</p> <p>Verifier(s): DeLeon, Christina</p> <p>Date Transcribed: Spring 2009</p> <p>Page: 3 of 9</p>
--	---

28	Stephanie	<p>Well, like this is one red and three yellow [<i>Stephanie picks up a tower</i> $\begin{bmatrix} Y \\ Y \\ R \\ Y \end{bmatrix}$].</p> <p>It'll be three red and one yellow. So it'll be just the opposite.</p>
29	R1	<p>Should we try it? [<i>R2 says something inaudible.</i>] [<i>Stephanie immediately begins to build towers.</i>] What do you think? [<i>Pause</i>] So tell us what you're doing while you're doing it.</p>
30	Stephanie	<p>Alright. Well, for this one</p>
31	R1	<p>Um hm</p>
32	Stephanie	<p>It has to have two red on top. So I put a red down there [<i>third position</i>] and now it's going to go [$\begin{bmatrix} R \\ R \\ Y \\ R \end{bmatrix}$] so there are two for that one. And for the second one – that one there [$\begin{bmatrix} R \\ R \\ R \\ Y \end{bmatrix}$] and [$\begin{bmatrix} R \\ Y \\ R \\ R \end{bmatrix}$] that one there. The third one</p>
33	R1	<p>Now let me see. The second one – help me understand this. You have to have a red -</p>
34	Stephanie	<p>[<i>The mistakenly placed tower is corrected.</i>] Oooh. – This is -</p>
35	R1	<p>Does that belong there?</p>

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven Date: 1996-04-17 Location: Union Catholic Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman Verifier(s): DeLeon, Christina Date Transcribed: Spring 2009 Page: 4 of 9</p>
--	---

36	Stephanie	<p>No. [Stephanie switches $\begin{bmatrix} Y \\ R \\ Y \\ R \end{bmatrix}$ with $\begin{bmatrix} R \\ Y \\ R \\ Y \end{bmatrix}$.]</p>
37	R1	<p>Okay. – Okay. So, let’s see. Let’s go through this again. So you have the red there and there [R1 indicates the top and third positions.]</p>
38	Stephanie	<p>Um hm. [She builds $\begin{bmatrix} R \\ R \\ Y \\ R \end{bmatrix}$ while R1 is speaking.]</p>
39	R1	<p>That’s still the same. You put it in the middle and here and here. Then you put it on the bottom.</p>
40	Stephanie	<p>Um hm. [Then she builds $\begin{bmatrix} R \\ Y \\ R \\ R \end{bmatrix}$. She continues building towers very confidently and quite quickly. She produces $\begin{bmatrix} R \\ R \\ R \\ Y \end{bmatrix} \begin{bmatrix} Y \\ R \\ R \\ R \end{bmatrix} \begin{bmatrix} R \\ R \\ Y \\ R \end{bmatrix} \begin{bmatrix} Y \\ R \\ R \\ R \end{bmatrix}$.] And then, um, this one [begins to collect the duplicates from among the towers $\begin{bmatrix} R \\ R \\ R \\ Y \end{bmatrix}$</p>

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes</p> <p>Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven</p> <p>Date: 1996-04-17</p> <p>Location: Union Catholic</p> <p>Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman</p> <p>Verifier(s): DeLeon, Christina</p> <p>Date Transcribed: Spring 2009</p> <p>Page: 5 of 9</p>
--	---

		$\begin{bmatrix} R \\ R \\ R \\ Y \end{bmatrix} \begin{bmatrix} R \\ R \\ R \\ Y \end{bmatrix}$ <p>, for example] this one and this one are the same. This one [she</p> $\text{picks up } \begin{bmatrix} R \\ R \\ Y \\ R \end{bmatrix}$
41	R1	So you tripled them.
42	Stephanie	This one
43	R1	Triplicates.
44	Stephanie	<p>Yeah. And that one. That one, that one, that one, and these three. So you have four. [She continues to sort the towers into triples. The result is:</p> $\begin{bmatrix} R & R & R & R & R & R & R & R & R & Y & Y & Y \\ R & R & R & R & R & R & Y & Y & Y & R & R & R \\ R & R & R & Y & Y & Y & R & R & R & R & R & R \\ Y & Y & Y & R & R & R & R & R & R & R & R & R \end{bmatrix}$
45	R1	So. – Is that what you predicted?
46	Stephanie	Yes.
47	R1	You predicted you would get triplicates.
48	Stephanie	I said there would be four, so it would be groups of three.
49	R1	So what would you be dividing by?

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes</p> <p>Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven</p> <p>Date: 1996-04-17</p> <p>Location: Union Catholic</p> <p>Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman</p> <p>Verifier(s): DeLeon, Christina</p> <p>Date Transcribed: Spring 2009</p> <p>Page: 6 of 9</p>
--	---

50	Stephanie	Three
51	R1	By three. And before that you were dividing by?
52	Stephanie	Two.
53	R1	And before that you were dividing by? We didn't do before that.
54	Stephanie	We didn't do that.
55	R1	We could've. We could've started with all yellow.
56	Stephanie	Um. Well. Yeah, but, we're gonna
57	R1	No red. – Let's see how that works with all yellow. Sorta I like (inaudible) explain (inaudible) from the beginning. Do you know what I'm saying?
58	Stephanie	Um hm.
59	R1	We might as well do them all. Is this the first one? We started with this? [Stephanie sneezes.] God bless you.
60	Stephanie	Thank you.
61	R1	You need some tissues? [Stephanie goes on building towers. This time every tower (four of them) are entirely yellow.] Before you do it, why don't you predict what will happen?
62	Stephanie	Oh. There'll be one.
63	R1	Why?
64	Stephanie	Because you're going to get yellow – all yellow from all four. 'Cause there's only one space you can put a yellow. So you're going to get one all yellow from here, one all yellow from here, one all yellow from here and one all yellow from here. So there's going to be one. [pause; Stephanie lines up

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven Date: 1996-04-17 Location: Union Catholic Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman Verifier(s): DeLeon, Christina Date Transcribed: Spring 2009 Page: 7 of 9</p>
--	---

		<i>four towers each built using four yellow Unifix cubes.]</i>
65	R1	Um. But there are four of them there. So...
66	Stephanie	You divide by four.
67	R1	Okay. So – If you were trying to help me know what to divide by, is there anything that helps you?
68	Stephanie	You – um – (inaudible) <i>[Stephanie repeats the question.]</i> What – is there anything that helps you
69	R1	Um hm.
70	Stephanie	like to know what to divide by?
71	R1	Um hm.
72	Stephanie	Um – the number of red, I guess? ‘Cause here you divided by one. <i>[Stephanie points to the towers with one red.]</i> Here you divided by two. <i>[Now she indicates the towers with two reds.]</i> And here you divided by three. <i>[She indicates the towers built with three reds.]</i>
73	R1	Here the number of red is zero. <i>[R1 points to the four all yellow towers.]</i>
74	Stephanie	No. But I’m saying here <i>[pointing to the area between the all yellow towers and the towers with one red.]</i> you divided by one. Like to get that -
75	R1	Um hm
76	Stephanie	I don’t know.
77	R1	Does that work? For all of them?
78	Stephanie	I guess not for this one, but like – the number of -- <i>[long pause]</i>
79	R1	Well, how does it work from here to here? <i>[R1 points from the towers with</i>

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven Date: 1996-04-17 Location: Union Catholic Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman Verifier(s): DeLeon, Christina Date Transcribed: Spring 2009 Page: 8 of 9</p>
--	---

		<i>three reds to the non-existent towers of four red.]</i>
80	Stephanie	Well. The same way it works there. It's just all red.
81	R1	All red. So--
82	Stephanie	And it would be four times one divided by one, 'cause there's only one spot.
83	R1	So it works here. So - -
84	Stephanie	Yeah.
85	R1	It's one spot here. One spot - - [R1 points to the one yellow cube in each of the towers with three reds and one yellow.]
86	Stephanie	Um hm.
87	R1	Um hm. So it works there.
88	Stephanie	Yeah.
89	R1	It's just that this situation here is – a little bit different. If you wanted it to be nice and consistent, you would –sometimes that forces
90	Stephanie	Um hm.
91	R1	people to make definitions particular ways.
92	Stephanie	Um
93	R1	'Cause you know you can't divide by zero. –Um - - so -
94	Stephanie	D – um – the number of spots you're pu – filling in – like – to get these [She indicates going from three yellow and one red to all yellow.] You put a yellow in one spot. Like – um – you know – I don't -
95	R1	Yeah.

<p>Description: Generating Unifix-cube towers 4 cubes tall from exactly 2 to exactly 3 red cubes and from exactly 3 yellow cubes to the tower with all 4 yellow cubes</p> <p>Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Seven of Seven</p> <p>Date: 1996-04-17</p> <p>Location: Union Catholic</p> <p>Researcher: Professor Carolyn Maher</p>	<p>Transcriber(s): Aboelnaga, Eman</p> <p>Verifier(s): DeLeon, Christina</p> <p>Date Transcribed: Spring 2009</p> <p>Page: 9 of 9</p>
--	---

96	Stephanie	Like to get these [<i>pointing to the towers with two reds and two yellows</i>] you put – there's – like – [<i>Stephanie sounds frustrated.</i>] I don't -
97	R1	No. You can't force it. It's very interesting. What do you think about it? [<i>to R2</i>]
98	R2	It's interesting.
99	R1	It is. Do you have a question?
100	R2	I feel like it's something missing though (inaudible) – with the four yellows. Is this the end here?
101	Stephanie	No. You can do four reds.
102	R1	Now. Maybe what we should do is write out the cases that work. We wrote out one of them really very clearly here. [<i>R1 takes out some papers.</i>] Right? You did the one here um where you started with um exactly one when it was green and blue in this case, right?